

JARE Syowa Station 11-m Antenna, Antarctica

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Abstract

The operation of the 11-m S/X-band antenna at Syowa Station (69.0°S, 39.6°E) by the Japanese Antarctic Research Expeditions (JAREs) started in February 1998 and continues until today (December 2010). A cumulative total of 91 quasi-regular geodetic VLBI experiments were observed by the end of 2010. Syowa Station will participate in six OHIG sessions in 2011.

The data from three OHIG sessions in 2010 were recorded on hard disks through the K5 terminal. They will be brought back from Syowa Station to Japan in April 2011. The data from the OHIG62 through the OHIG69 sessions observed by JARE48 and JARE49 have been transferred to the Bonn Correlator directly by way of one of NICT's servers. Analysis results calculated by the GSFC IVS Analysis Center from the data until the OHIG69 session indicate that the length of the Syowa-Hobart baseline is increasing with a rate of 55.3 ± 0.9 mm/yr and that the length of the Syowa-HartRAO baseline is increasing with a rate of 10.9 ± 0.8 mm/yr. The length of the Syowa-O'Higgins baseline is slightly increasing with a rate of 2.5 ± 1.5 mm/yr.

1. Overview

Syowa Station has become one of the key observatories in the Southern Hemisphere's geodetic network, as reported in [1]. For VLBI, the Syowa antenna is registered as IERS Domes Number 66006S004 and as CDP Number 7342. The basic configuration of the Syowa VLBI front-end system has not changed from the description in [2].

A K5 recording system was introduced at Syowa Station in September 2004. Syowa's K4 recording terminal was fully replaced by K5 simultaneously with the termination of the SYW session at the end of 2004. Syowa has participated in the OHIG sessions in the austral summer season since 1999. Data transfer through an Intelsat satellite link from Syowa Station to NIPR became possible with the introduction of the K5 system, but huge VLBI data transfers are not realistic because of the low transfer speed.

2. Notes on System Maintenance

There is no significant problem in the "mechanical system". After the hydrogen maser set (Anritsu RH401A; 1002C) had been used for observations from 2004 to 2010, it was turned off at the end of 2010, because of problems in the 10 MHz output. A backup hydrogen maser set (Anritsu RH401A; 1001C) replaced the 1002C, and it is operating normally. The hydrogen maser 1002C will be back to Japan in April 2011. It will be overhauled and will be deployed in Syowa in January 2012 again. The tube in the Cs frequency comparator and local oscillator will have to be replaced with a new one in the near future.

3. Session Status

Table 1 summarizes the status of processing as of December 2010 for the sessions after 2004. The OHIG sessions involved Fortaleza (Ft), O'Higgins (Oh), Kokee Park (Kk), Parkes (Pa), TIGO Concepción (Tc), Syowa (Sy), Hobart (Ho), and HartRAO (Hh). In 2005, Syowa joined the CRD sessions, but after 2006, Syowa participated only in OHIG sessions. Syowa participated in three

OHIG sessions in 2010.

Until 2004, K4 tapes containing the OHIG sessions' data from Syowa Station were copied to Mark IV tapes at GSI, and the Mark IV tapes were sent to the Mark IV Correlator for final correlation. Since the introduction of the K5 system, K5 hard disk data brought back from Syowa Station have been transferred by ftp to the MIT Haystack Observatory or the Bonn Correlator through a NICT server and converted to the Mark 5 format data there.

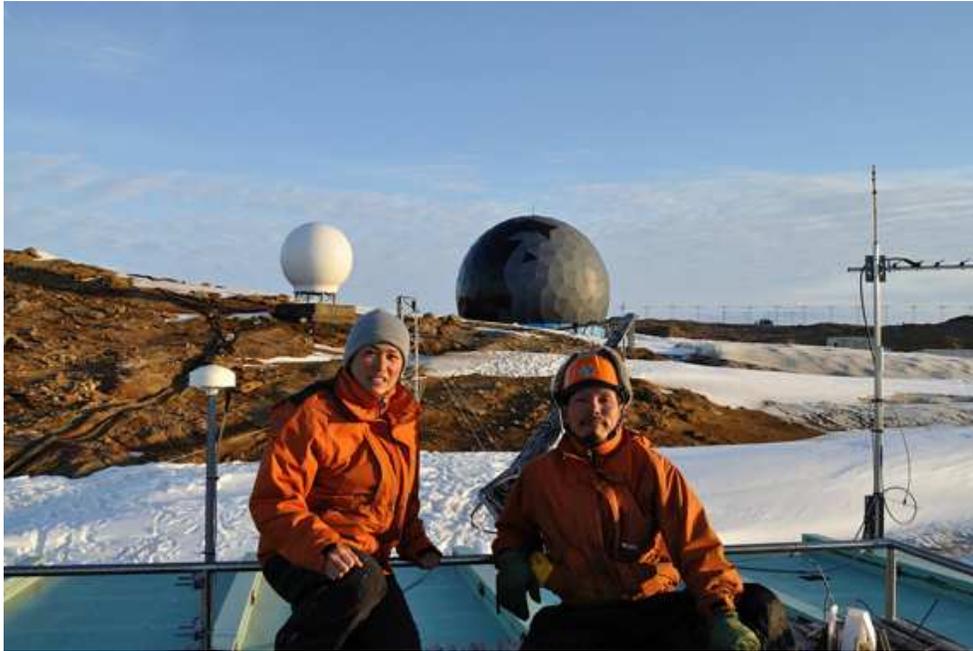


Figure 1. Syowa VLBI staff for JARE-51 (February 2010 — January 2011).

4. Staff of the JARE Syowa Station 11-m Antenna

- Kazuo Shibuya, Project coordinator at NIPR.
- Koichiro Doi, Yuichi Aoyama, Liaison officer at NIPR.
- Yuichi Aoyama (from National Institute of Polar Research), Chief operator for JARE-49 (February 2008 — January 2009).
- Hideaki Kumagai (from NEC), Antenna engineer for JARE-49.
- Yusuke Murakami (from University of Tokyo), Chief operator for JARE-50 (February 2009 — January 2010).
- Yuji Yamaguchi (from NEC), Antenna engineer for JARE-50.
- Iuko Tsuwa (from University of Tokyo), Chief operator for JARE-51 (February 2010 — January 2011) (left in Figure 1).
- Yoshinao Kinjyo (from NEC), Antenna engineer for JARE-51 (right in Figure 1).

Table 1. Status of OHIG and CRDS sessions as of December 2010.

Code	Date	Station	Hour	Correlation	Solution	Notes
OHIG37	2005/Feb/02	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	J46
OHIG38	2005/Feb/15	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	
CRDS18	2005/Apr/11	Ho, Hh	24 h	Yes	Yes	
CRDS19	2005/May/10	45, Hh	24 h	Yes	Yes	
OHIG39	2005/Nov/08	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	
OHIG40	2005/Nov/09	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	
OHIG41	2005/Nov/16	Ho, Hh, Ft, Oh, Kk	24 h	Yes	Yes	
OHIG42	2006/Jan/31	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG43	2006/Feb/08	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Yes	J47
OHIG44	2006/Feb/14	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG45	2006/Nov/07	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG46	2006/Nov/14	Ho, Hh, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG47	2006/Nov/29	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG49	2007/Feb/13	Ho, Hh, Ft, Oh, Kk, Tc	24 h	Yes	Yes	J48
OHIG51	2007/Nov/06	Ho, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG52	2007/Nov/07	Ho, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG53	2007/Nov/13	Ho, Hh, Ft, Oh, Kk, Pa, Tc	24 h	Yes	Yes	
OHIG54	2007/Nov/14	Ho, Hh, Ft, Oh, Kk, Pa, Tc	24 h	Yes	Yes	
OHIG55	2008/Feb/06	Hh, Oh, Kk, Tc	24 h	Yes	Yes	J49
OHIG56	2008/Feb/12	Hh, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG57	2008/Feb/13	Hh, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG59	2008/Nov/12	Ho, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG60	2008/Nov/18	Ho, Ft, Oh, Kk, Pa, Tc, Ts	24 h	Yes	Yes	
OHIG61	2008/Nov/19	Ho, Ft, Oh, Kk, Tc	24 h	Yes	Yes	
OHIG62	2009/Feb/04	Ft, Ho, Kk, Oh, Tc	24 h	Yes	Yes	J50
OHIG63	2009/Feb/10	Ft, Ho, Kk, Oh, Tc	24 h	Yes	Yes	
OHIG64	2009/Feb/11	Ft, Ho, Kk, Oh, Tc	24 h	Yes	Yes	
OHIG65	2009/Nov/10	Ho, Kk, Oh, Tc	24 h	Yes	Yes	
OHIG66	2009/Nov/11	Ho, Kk, Oh, Tc	24 h	Yes	Yes	
OHIG67	2010/Feb/03	Ft, Kk, Oh, Tc	24 h	Yes	Yes	J51
OHIG68	2010/Feb/09	Ft, Ho, Kk, Oh, Tc, Hb	24 h	Yes	Yes	
OHIG69	2010/Feb/10	Ft, Ho, Kk, Oh, Tc, Hb	24 h	Yes	Yes	

45: DSS45, Ts: Tsukuba32

J46: JARE-46, op K. Egawa eng I. Okabayashi J47: JARE-47, op T. Sawagaki eng H. Ishii

J48: JARE-48, op N. Arai eng H. Sugawara J49: JARE-49, op Y. Aoyama eng H. Kumagai

J50: JARE-50, op Y. Murakami eng Y. Yamaguchi J51: JARE-51, op I. Tsuwa eng Y. Kinjyo

5. Analysis Results

As of the end of December 2010, 75 sessions from May 1999 through February 2010 have been analyzed with the software CALC/SOLVE developed by NASA/GSFC.

According to the result analyzed by the GSFC IVS Analysis Center, the length of the Syowa-Hobart baseline is increasing with a rate of 55.3 ± 0.9 mm/yr. The Syowa-HartRAO baseline shows a slight increase with a rate of 10.9 ± 0.8 mm/yr. These results agree approximately with those of GPS. The Syowa-O'Higgins baseline also shows slight increase, although the rate is only 2.5 ± 1.5 mm/yr. Detailed results from the data until the end of 2003 as well as comparisons with the results from other space geodetic techniques are reported in [3].

References

- [1] Shibuya, K., Doi, K., and Aoki, S. (2003): Ten years' progress of Syowa Station, Antarctica, as a global geodesy network site. *Polar Geoscience*, 16, 29-52.
- [2] Shibuya, K., Doi, K., and Aoki, S. (2002): JARE Syowa Station 11-m Antenna, Antarctica, in *International VLBI Service for Geodesy and Astrometry 2002 Annual Report*, 149-152, NASA/TP-2003-211619, ed. by N. R. Vandenberg and K. D. Baver.
- [3] Fukuzaki, Y., Shibuya, K., Doi, K., Ozawa, T., Nothnagel, A., Jike, T., Iwano, S., Jauncey, D.L., Nicolson, G.D., and McCulloch, P.M. (2005): Results of the VLBI experiments conducted with Syowa Station, Antarctica. *J. Geod.*, 79, 379-388.